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TABLE OF CONTENTS

Page

DOES CONTINENTAL TRADING CO-MOVE? A PRE, POST AND AMID FINANCIAL CRISIS ANALYSIS OF CDS, STOCK AND BOND MARKETS	7
<p>Syed Kumail Abbas Rizvi, Lahore School of Economics (LSE), Lahore, Pakistan Ghulame Rubbaniy, College of Business, Zayed University, Abu Dhabi, UAE Bushra Naqvi, Lahore University of Management Sciences, (SDSB), Lahore, Pakistan Sander Den Hartog, Erasmus School of Economics, Erasmus University, Rotterdam, Rotterdam, The Netherlands.</p>	
MEAN-VARIANCE OPTIMAL PORTFOLIOS CONSIDERING SKEWNESS AND KURTOSIS	23
<p>Sandip Mukherji, Howard University, Washington, DC, USA</p>	
INTERNATIONALIZATION, CORPORATE GOVERNANCE AND FIRM VALUE	31
<p>Wei Ning, Texas A&M International University, Laredo TX USA Jorge Brusa, Texas A&M International University, Laredo TX USA</p>	
ENTERPRISE RISK MANAGEMENT: A STUDY ABOUT THE LEVEL OF ERM IMPLEMENTATION IN BRAZILIAN COMPANIES ISSUING ADRs	37
<p>Jose Luiz Barros Fernandes, University Catholic of Brasília, Brasília, Brazil Alberto S. Matsumoto, University Catholic of Brasília, Brasília, Brazil Ricardo Gonçalves da Silva University Catholic of Brasília, Brasília, Brazil Rafael Araújo University Catholic of Brasília, Brasília, Brazil</p>	
A MONETARIST CRITIQUE OF THE FEDERAL RESERVE'S MONETARY POLICY IN THE 2008-2013 PERIOD IN RESPONSE TO THE GREAT RECESSION AND FINANCIAL CRISIS	45
<p>Charles W. Johnston, Center for Graduate Studies, Baker College, Flint, Michigan, USA</p>	
CAPITAL STRUCTURE OF CONSTRUCTION SECTOR IN MEXICO: PANEL DATA ANALYSIS	51
<p>Juan Gaytan-Cortes, University of Guadalajara-CUCEA, Guadalajara, Jalisco, Mexico Gonzalo Maldonado-Guzman, University Autonomous of Aguascalientes, Aguascalientes, Ags. Mexico Juan Antonio Bargas-Baraza, University of Guadalajara-CUCEA, Guadalajara, Jalisco, Mexico</p>	
CREATING OPTIMAL MUTUAL FUND PORTFOLIOS USING EXCEL SOLVER	57
<p>Larry J. Prather, Southeastern Oklahoma State University, Durant, Oklahoma Han-Sheng Chen, Southeastern Oklahoma State University, Durant, Oklahoma Ying-Chou Lin, Southeastern Oklahoma State University, Durant, Oklahoma</p>	

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CAPITAL STRUCTURE OF CONSTRUCTION SECTOR IN MEXICO: PANEL DATA ANALYSIS

Juan Gaytan-Cortes, University of Guadalajara-CUCEA, Guadalajara, Jalisco, Mexico
Gonzalo Maldonado-Guzman, University Autonomous of Aguascalientes, Aguascalientes, Ags. Mexico
Juan Antonio Bargas-Baraza, University of Guadalajara-CUCEA, Guadalajara, Jalisco, Mexico

ABSTRACT

The existence of an optimal capital structure for the company and the way it should be determined, have been one of the most controversial issues in the financial literature since the publication of the article by Modigliani and Miller (1958). The purpose of this research was to determine the mathematical relation between, the financial country factors and the company factors to incorporate debt in their capital structure, used for the construction sector that quoted on the Mexican Stock Exchange in the periods 2000-2012. In this study the long term debt was the dependent variable and through the E-views 8.1 program, the panel data technique was applied in order to determine the mathematical relation between the independent factors.

The mathematical model and the factors used for this empirical study in the research and discussion were identified into the theoretical framework. The study results are from theoretical and practical interest, identifying and understanding the relationship of the main factors by including debt in the capital structure facilitates and contributes to the normative postulates' construction.

Key words: Capital structure, Factors of the company, and factors of the country.

1. INTRODUCTION

This paper outlined the many financial theories which have been designed throughout time trying to explain different approaches to the formation of the financial structure that supports the investment and operation in enterprises, among them noted that the theories of greater importance have been conceived in countries with more developed capital markets. However, it is important to note that among developed countries, those developing and not developed, there are differences in the dispersion of ownership of enterprises in the size, diversity of markets, costs and financial difficulties in tax laws in the separation between the management of companies and their shareholders in companies with very scattered property, agency costs and symmetry of information, culture and beliefs of personnel who manages the company.

The absence of policies, rules or models in real life businesses to generate their own capital structure, motivated this investigation implying the involving the reviewing of the theories, the empirical studies, the existing hypotheses, the major postulates, to determine their mathematical relationship between debt and the capital structure. Thus, we established a solid foundation to the problem, the questions and the established objectives. The studies of the capital structure in Mexico are fundamental, because the lack of a robust model to explain the financial decisions in the Mexican organizations, justify this research, particularly in the construction sector.

2. THEORETICAL FRAMEWORK

The financial literature since Modigliani and Miller (1958) published their article and showed their propositions over the capital structure, the existence or not of an optimal capital structure for the enterprises, as well the way it should be determined, has been one of the most controversial topics. It has been 56 years since the publication of the seminal work that gave origin to corporate finances as we

know nowadays and at the same time caused that capital structures studies caught so much attention from the economy and financial areas. However, the broad research done on the capital structure theory, to this day, is no conclusive in answers. The theoretical models developed during the last years, have tried since to validate and generalize sometimes, the thesis of the irrelevance of Modigliani and Miller (1958); other times, the models have been tried to adjust the thesis of maximum indebtedness of Modigliani and Miller (1963). From the convergence of both lines of research on the decade of the 60's emerged a renovated theory of the capital structure postulating the existence of an optimal structure to the proposed problem. In this research were reviewed the following theories: optimal capital structure, Theory of the Fiscal Tax Base, Theory of the Asymmetric Information, The Theory of the Agency Costs, The Free Cash Flow Theory, The *Pecking Order Theory* (POT); This last theory was formally proposed by Myers (1984), based in the preliminary work of Donaldson. (1961).

The empirical studies that support all the above mentioned theories, were also reviewed, highlighting among others, the studies done by Rajan and Zingales (1995), and the study of Wald (1999), these studies offered empirical evidence for G-7 countries. They were analyzed some institutional factors of the company, such as: The total assets (size of the firm), profit, sales (growth rate), and the capital (risk). In the empirical studies, as well as the financial theories, the knowledge has increased and evolved; however, in the different researches done hasn't been achieved the construction of a model that includes jointly all the factors considered capital structure determinants, among the published investigations, we can mention the ones made Filbeck and Gorman (2000), Bradley, Chung (1993), Van el Der (1989), Kester (1986), Harrel and Kim (1984).

Arias, M., Arias, L., Pelayo and Cobián (2009), argued that is necessary to do an specialized research about this matter in the Mexican companies with the purpose of achieving a better understanding about their contracting and debt decisions, in order to design financial instruments adequate to their financial needs and to facilitate and support their growth.

The empirical evidence suggests that besides the specific factors of the company also the macroeconomic factors or institutionals of each country are important of the capital structure (Booth L., Aivazian, V., Demirguc-Kunt, A. and Maksimovic, V. (2001), Antoniou, Guney, and Paudyal (2008), Gaytan and Bonales (2009), Dias, Thosiro and Cruz, (2009), Dias and Toshiro (2009). Nevertheless, the most part of the theoretical debate and empirical about the incorporation of the debt in the capital structure, has stayed conditioned by well-developed the capital markets and with a financial architecture well structured, Singales (2000).

3. HYPOTHESIS

The interest rate, the operation profit, the exchange rate, the fiscal tax rate, and the capital are factors that are negatively related; on the contrary the inflation, the total assets and the net sales are factors that are positively related, incorporating debt in the capital structure used by the companies of the construction sectors in Mexico.

4. METHODOLOGY

The econometric model of the panel data was chosen and used to calculate the mathematical relationship of the factors, the sample of the factors was used for the period from 2000 to 2012, the technique of this model combines data of temporary dimension and cross-section cut. The model is also known as longitudinal joint, gathered data, times series and cross-section, micro-panel data, history analysis and peer analysis. (Gujarati, 2003).

The analysis of the panel data studies the data set, putting together the cross section cut and the time series. The available information is processed and presented in two dimensions, generating multiple observations for each economic unit, enriching the empirical analysis. (Rivera, 2007), (Mayorga and Muñoz 2000), (Gujarati, 2003), (Mur and Angulo, 2006), (Rivera, 2007).

5. SOURCE AND DATA COLLECTION

The specific variables of the companies were obtained from the financial statements published in the financial yearbook of the Mexican Stock Exchange, the source is very reliable, according to the specific laws, the companies listed on the Stock Exchange have the obligation to generate reports at the end of each quarter (Schneider, 2001). The macroeconomic data were obtained by databases and publications made by the Bank of Mexico.

The study sample was not probabilistic, because all the companies from the transformation and commerce sector that were listed in 2000-2012 periods were considered. According to the stratification of the Official Journal of the Federation of Mexico, published in June 2009, for its size, all are classified as large companies.

This research considered the dependent variable: The Long-Term Liabilities. We also considered eight independent variables, of which four are company-specific variables: Total Assets, Net Sales, Operating Income and Capital, and the other four are the country's macroeconomic variables: Income Tax Rate (ITR), Interest Rate, Inflation and Exchange rate.

6. ANALYSIS AND INTERPRETATION OF RESULTS

After applying the multivariate technique of panel data, that involved the dependent and independent variables, the economic model showed the existence of a high correlation between the independent variables, causing multicollinearity. Is, some independent variables showed a significance greater than 5%. So the null hypothesis was not rejected. The null hypothesis for each complementary hypothesis was defined as: $H_0: B_i = 0$, where i is the independent variable to the level of significance of 5%

Test (VIF). The inflation factor of the variables variance must be less than 10. The (VIF) calculated considering all the variables in the two sector showed to be outside of range. The test was repeated, considering only the variables of the redefined model after applying the stepwise method. The result showed a decrease in the average variance inflation factor to 1.14, which is into the acceptable ranges test. (Table 1).

TABLE 1
CONSTRUCTION (VIF) With significant variables

Variable	VIF	1/VIF
Net Sales	1.08	0.928897
Operating Incom	1.04	0.928897
Income Tax	1.25	0.799328
Inflation	1.21	0.828337
Mean VIF	1.14	

Source: Own elaboration, based on financial data of the Mexican Stock Exchange 2000-2012

The multivariate regression of panel data (fixed effects), shows that the net sales and inflation have positive correlation; the income tax and operating income have negative correlation incorporating the long term liabilities. (Table 2)

TABLE 2 - Final results, after applying the data panel technique, using the E-Views 8.1 program:

Dependent Variable: Long-Term Liabilities				
Method: Pooled EGLS (Cross-section weights)				
Date: 06/20/15 Time: 08:52				
Sample: 2000 2012				
Included observations: 13				
Cross-sections included: 14				
Total pool (balanced) observations: 182				
Linear estimation after one-step weighting matrix				
White cross-section standard errors & covariance (d.f. corrected)				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	3457708.	1327721.	2.604244	0.0101
Net Sales	1.373383	0.072114	19.04458	0.0000
Income Tax	-15192084	5086669.	-2.986647	0.0033
Inflation	39614089	10290283	3.849660	0.0000
Operating Incom	-1.065340	0.218635	-4.872695	0.0000
Fixed Effects (Cross)				
Weighted Statistics				
R-squared	0.940954	Mean dependent var	32553639	
Adjusted R-squared	0.934833	S.D. dependent var	32127451	
S.E. of regression	9453848.	Sum squared resid	1.47E+16	
F-statistic	153.7337	Durbin-Watson stat	0.779727	
Prob(F-statistic)	0.000000			

Source: Own elaboration base on financial data of the Mexican Stock Exchange 2000-2012

TABLE 3 - Important factors that have mathematical relation in incorporating long-term debt in the capital structure of the construction sectors.

CONCEPT	Net Sales	Operating Inc.	Income Tax	Inflation
Construction	***	***	**	***

Source: Own elaboration with the results of the E-Views 8.1 program

7. CONCLUSIONS

The research reached its purpose to identify the positive or negative relationship of the quantitative factors between the debt and the capital structure into construction sector in the period 2000 to 2012 in Mexican stock market. The models of the companies were tested with the statistical technique of "panel data".

The problem of multicollinearity demanded redefine, the models using the method stepwise to improve levels of adjustment and explanation also improved the existence of collinearity with the test (VIF).

The independent variables that were excluded for the reasons for the adjustment to the multivariate model are as follows: The capital, interest rate, exchange rate and total assets.

Finally the variables that have mathematical relationship in incorporating long-term debt in the capital structure of the construction sector were identified.

The multivariate regression of panel data (fixed effects), shows that the net sales and inflation have positive correlation and, income tax and operating income have negative correlation incorporating the

long term liabilities in construction sector. Fulfilled our mission and thus answering the general hypothesis of our approach.

The results are useful for generating standards and guidelines, facilitating decision-making by incorporating debt in the capital structure of companies in the construction sector in Mexico. The results will decrease uncertainty and support decisions in tangible and intangible assets of investment projects done by companies in the construction sector.

Factors emanating from the qualitative characteristics such as culture, power, country risk, and personal values, are aspects that can influence and change the results, which is why we suggest to be included in future research.

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Note: "Contact author for the list complete of references"

AUTHOR PROFILE

Dr. Juan Gaytan-Cortes earned his Ph.D. at University National Autonomous of Mexico, Mexico, D.F. in 2007. Currently he is a Titular Research Professor of Marketing and International Business Department at University of Guadalajara-CUCEA.

Dr. Gonzalo Maldonado-Guzman, earned his Ph.D. at University of Valencia, Spain. Currently he is a Titular Research Professor and Business Research, University Autonomous of Aguascalientes.

Dr. Juan Antonio Vargas-Barraza earned his Ph.D. at University Autonomous of Madrid, Spain in 2010. Currently he is a Titular Research Professor of Marketing and International Business Department at University of Guadalajara-CUCEA.